Please add the following new claims:

26. (New) The toner of Claim 1, comprising a polyester binder resin.

27. (New) The toner of Claim 1, comprising a polyol binder resin.

28. (New) The toner of Claim 1, wherein the monomer (3) is selected from the group consisting of methyl(meth)acrylate, ethyl(meth)acrylate, propyl(meth)acrylate, n-butyl(meth)acrylate, isobutyl(meth)acrylate, stearyl(meth)acrylate, dodecyl(meth)acrylate, 2-ethylhexylacrylate and combinations thereof.

29. (New) The toner of Claim 1, comprising a monomer (3) selected from the group consisting of 2-ethylhexylacrylate, n-butyl(meth)acrylate and mixtures thereof.

REMARKS

Claims 1-17 and 20-29 are active in the present application. Claims 1-17 and 26-29 are currently under active prosecution. Claims 1-17 have been amended for clarity. Claim 1 has been further amended to limit monomer (3) to those monomers which are non-fluorinated. Support for the amendment is found on page 15, lines 9-15 wherein examples of acrylate and/or methacrylate monomers are provided and Comparative Example 3 in Table 4, page 68. Each of the monomers provided contains only hydrocarbon substituents that contain no fluorine atoms. The fluorinated acrylate present in toner T15 of Comparative Example 3 is a comparative example that provides inferior performance. Claims 2 and 11 have been amended to specify that the amount of the components is recited in weight %. Support is found on page 17, line 13 through page 18, line 21 and page 24, lines 14-24. Claims 26-29 are new claims. Support for new Claims 26 and 27 is found in original Claim 1. Support for new Claim 28 is found on page 15, lines 10-14. Support for new Claim 29 is found on page 15, lines 14-15. No new matter is believed to have been added by this amendment.

REQUEST FOR RECONSIDERATION

Applicants thank Examiner Rodee for the helpful and courteous discussion of December 16, 2002. During the discussion, the Examiner indicated that an amendment to Claim 1, limiting the monomer component (3) to non-fluorinated monomers, may overcome the rejections in view of the prior art relied upon by the Examiner, pending a review of Applicants' written response.

Claim 1 has been amended to limit component (3) to non-fluorinated acrylates and non-fluorinated methacrylates. The presently claimed invention is drawn to an electrophotographic toner which includes a resin negative charge control agent. The charge control agent contains polymerized units of a sulfonic-acid containing monomer, an aromatic monomer having electron-withdrawing groups, and non-fluorinated acrylate and/or non-fluorinate methacrylate monomers.

Applicants submit that the application as originally filed reasonably conveys to the skilled artisan that Applicants had possession of the claimed subject matter at the time of filing.[1] The examples of acrylate and/or methacrylate monomers presented on page 15, lines 14-15 of the specification include eight examples of acrylate or methacrylate monomers containing only hydrocarbon substituents, no fluorinated monomers are presented. A resin charge controlling agent containing a fluorinated acrylate monomer is disclosed as Synthesis Example 8 (page 48, line 17-page 19, line 2). This resin charge control agent is employed in Comparative Example 3 and is described as "a charge control agent not comprising acrylate monomers and/or methacrylate monomers" (page 63, lines 3-4 from the bottom). As is

[1]See, for example, *Ex parte Sorenson*, 3 USPQ 2d 1462 (BPAI 1987) wherein the presentation of working examples was found to be sufficient for an Applicant to define a subgenus of an originally described group of compounds.

shown in Table 1 on page 65 of the specification, toner T-15 (Comparative Example 3) which contains a fluorinated methacrylate monomer does not provide the transparency and grindability properties of toners T-1 through T-8.

Therefore, the description of non-fluorinated acrylate and/or methacrylate groups is implicitly disclosed in the original specification as evidenced by the group of acrylate and methacrylate monomers provided on page 15 and the Examples which show that acrylate and methacrylate groups containing non-fluorinated monomers provide improved toner properties.

A negative limitation such as the requirement in amended Claim 1 that the acrylate and methacrylate monomers are limited to non-fluorinated monomers is valid and does not violate 35 U.S.C. §112, first paragraph even in the absence of *ippsis verbis* support for such a negative limitation in the originally filed U.S. application. In the present application, the inclusion of the negative limitation toward fluorinated acrylate and fluorinated methacrylate groups does not introduce any new concepts in violation of the description requirement of the first paragraph of 35 U.S.C. § 112, since the specification as originally filed provides, on page 18, lines 9-15, a group of acrylate and methacrylate monomers, none of which are fluorinated. Further, the Examples of the specification indicate that fluorinated monomers may contribute to poor transparency and grindability in toners which incorporate fluorinated monomers in the charge control agent.[2] Further, the Example containing the fluorinated acrylate is referred to as a Comparative Example (see Comparative Example 3 containing toner T-15). Thus the

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[2]See *Ex parte Parks*, 30 USPQ 2d 1234 (BPAI 1993). In this decision, the Board of Patent Appeals and Interferences noted that even when the specification does not provide word-for-word support for a negative limitation, if the specification of the originally filed disclosure would have conveyed to one of ordinary skill in the art the concept encompassing the negative limitation, its introduction is not new matter.

specification as filed conveys that Applicants had possession of the claimed invention at the time of filing the original application.

The Office rejected the claims under 35 U.S.C. § 102(b) in view of JP 11-218965 and Nakanishi (U.S. 5,728,501). The JP 11-218965 patent is discussed in the present specification on page 8 where it is disclosed that the copolymers of the patent are unable to provide the desired toner performance characteristics.

JP 11-218965 describes a resin charge controlling agent that contains units of a sulfonate group-containing monomer, a perfluoroalkyl group-containing monomer, and an aromatic monomer having electron withdrawing groups (see Abstract). No where in the specification are non-fluorinated acrylate or methacrylate groups disclosed as one of the three required components of the prior art resin charge controlling agent. The perfluoroalkyl groups of the prior art copolymer are presented in paragraph [0011] of the English machine translation. The Examples presented in paragraphs [0043]-[0049] each contain a perfluoroalkyl(meth)acrylate. No where is a charge controlling agent disclosed that contains the presently claimed combination of a sulfonic-acid containing monomer, an aromatic monomer having an electron-withdrawing group, and a non-fluorinated acrylate monomer and/or non-fluorinated (meth)acrylate monomer.

The Nakanishi patent discloses a charge controller for a toner that contains a polymer having monomer units of an aromatic ring substituted with an electron-attracting group together with a copolymer containing polymerized units of a monomer having an organic acid group together with one or more copolymerizable monomers (A2) (see Abstract). The charge controller of the prior art does not require each of the sulfonic-acid group containing monomer, aromatic monomer containing an electron-withdrawing group, and non-fluorinated acrylate or methacrylate monomer of the present invention. However, it is disclosed that

copolymer (A1) may contain other copolymerizable monomers (column 3, lines 24-27) which may include perfluoroalkyl group containing monomers (3-1) and other copolymerizable monomers (4) (column 3, lines 28-33). The perfluoroalkyl group containing monomers (3-1) do not anticipate the presently claimed invention wherein only non-fluorinated acrylate and methacrylate monomers are permitted. The patent discloses in column 4, lines 27-30 that perfluoroalkyl group-containing monomers are preferred.

The other copolymerizable monomers (4) of the patent include such materials as olefins, vinyl ethers, aromatic vinyl hydrocarbons, methacrylic acids, alkyl(meth)acrylates, dienes, vinyl esters and monomers having a nitrile group (column 4, lines 30-40). However, no where does Nakanishi disclose that the charge controller of the prior art toner must contain a charge controlling agent having at least (1) a sulfonic-acid group containing monomer, (2) an aromatic monomer having electron-withdrawing groups, and (3) a non-fluorinated acrylate or non-fluorinated methacrylate monomer.

All of the suitable examples of polymer (A) disclosed on column 8, line 45 through column 9, line 48 require that the methacrylates be fluorinated. While examples of the copolymer (AB) include acrylates that are non-fluorinated, these materials do not contain the three components required in present Claim 1 (column 9, line 53 to column 10, line 4). Likewise, the Examples A6-A13 utilize only fluorinated methacrylate monomers.

The Nakanishi patent therefore does not disclose a charge controlling agent that contains the three monomer components required by present Claim 1.

The prior art references JP 11-218965 and Nakanishi require the presence of a fluorinated monomer (acrylate or methacrylate group). In contrast, the presently claimed invention limits the charge controlling agent to non-fluorinated acrylate or non-fluorinated

methacrylates. The prior art references require an element exclude from the presently claimed invention and cannot anticipate or render obvious the presently claimed invention.

The Office further rejected Claims 1-19 under the judicially created doctrine of obviousness-type double patenting in view of copending U.S. Application Serial No. 10/114,056 (Claims 1-17 and 45-85). In the Office Action the Examiner noted that the toner of the copending application falls entirely within the scope of the presently claimed toner. The toner of the copending application includes a charge controlling agent that is obtained from units of acrylic ester and methacrylic ester monomers (see Claim 1 of the copending application). The copending application does not limit the acrylic ester or methacrylic ester monomers to those monomers which are non-fluorinated. Therefore the toner of Claim 1 of the copending application does not fall entirely within the scope of present Claim 1.

The binder resin of copending 10/114,056 is required (1) to contain a polyester resin wherein the molecular weight distribution is limited so as to restrict the total amount of materials of higher molecular weight (>500) to less than 4% by weight, (2) to exclude THF solubles and (3) to have a peak present in the GPC corresponding to a molecular weight of from 3,000 to 9,000. Such limitations are not present in the present claims. The claims of the present application and copending 10/114,056 are therefore not obvious over one another.

The claims have been amended for clarity. The amendment to the claims overcomes the claim objections and rejections under 35 U.S.C. § 112.

The letter to the Examiner submitted on November 6, 2002 contains the statement "the Information Disclosure Statement submitted herewith is the only Information Disclosure Statement that has been or will be submitted in this case." This statement was intended to refer only to the IDS submitted concurrently with the letter which replaced the IDS of June 5, 2002.

Applicants thank the Examiner for returning a signed and initialed copy of the PTO-1449 submitted with the IDS. The IDS also included a list of related cases containing 14 references. Four of the references provided on the list of related cases are U.S. applications. On page 3 of the Office Action, the Examiner noted that the references submitted with the Information Disclosure Statement filed on December 26, 2001, were not identified by application number, inventor or filing date. Copies of the claims, abstract and figures for 09/843,357; 09/643,910; and 09/712,927, identifying the serial number and filing date, are attached herewith. Application no. 09/667,717 issued as U.S. patent no. 6,360,068 on March 19, 2002 (copy attached).

Applicants further request that a signed and initialed copy of the form PTO-1449 filed on January 29, 2003 by returned with the next communication from the Office. A copy is attached herewith for the Examiner's convenience.

RESPONSE TO RESTRICTION REQUIREMENT

The Office required restriction of the original claims as follows.

Group I (Claims 1-19), drawn to a toner, developer and apparatus, and

Group II (Claims 20-25), drawn to a method of forming images.

Applicants elected, with traverse, the claims of Group I (Claims 1-19) for further prosecution on October 21, 2002.

The Office restricted the Claims of Group I and Group II asserting that the claims of the two groups are related as product and process of use. Citing to MPEP § 806.05(h), the Office notes that inventions can be shown to be distinct of (1) the process for using the product as claimed can be practiced with another materially different product, or (2) the product as claimed can be used in a materially different process of using that product. The

Office further asserts that the product of the present application can be used in a process such as forming an electrostatic latent image on a dielectric surface using an ionographic stylus, developing the image with a toner, and fusing the image to the dielectric surface. The Office has asserted that such a process is materially different.

While the Office has provided an example of an alleged process that may use the claimed product, the Office has not provided an evidence that the process is actually materially different from the process of Group II. Applicants respectfully submit the Office has not sufficiently supported the Restriction Requirement and respectfully request the withdrawal of the Restriction Requirement.

Applicants submit the amendment to the claims places all claims in condition for allowance. Applicants respectfully request the withdrawal of the rejections and the passage of all now pending claims to Issue.

Respectfully submitted,

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Marked-Up Copy
Serial No: 09/964,622
Amendment Filed Herewith

IN THE CLAIMS

--1. (Amended) An electrophotographic toner comprising at least a binder resin, a colorant, and a resin negative charge control agent,

wherein said binder resin is a polyester and/or a polyol, and

said resin negative charge control agent comprises [components which are] polymerized units of (1) sulfonic acid-containing monomers, (2) aromatic monomers having electron-withdrawing groups, and (3) at least one non-fluorinated acrylate monomer, [and/or] non-fluorinated methacrylate monomer or a mixture thereof.

2. (Amended) The electrophotographic toner according to claim 1, wherein the weight % [ratio] of said sulfonic acid-containing monomers [to] based on the weight of the resin negative charge control agent is between 1 to 30 % by weight; [ratio of] the weight % of the aromatic monomers having electron-withdrawing groups [to] based on the weight of said resin negative charge control agent is between 1 to 80 % by weight; and the weight % [ratio] of said acrylate and/or methacrylate monomers [to] based on the weight of said resin negative charge control agent is between 10 to 80 % by weight.

3. (Amended) The electrophotographic toner according to claim 1, wherein said aromatic monomers having electron-withdrawing groups are at least one selected from the group consisting of, phenyl maleimides and phenyl itaconimides, wherein the electron withdrawing groups may be substituted with chlorine atoms or nitro groups.

4. (Amended) The electrophotographic toner according to claim 1, wherein said resin negative charge control agent further [contains] comprises polymerized units of one or more aromatic vinyl monomers [as its component unit].

5. (Amended) The electrophotographic toner according to claim 4, wherein the weight percentage of said aromatic vinyl monomers contained in the resin negative charge control agent is 30 % [or less by weight] based on the total weight of the resin negative charge control agent.

6. (Amended) The electrophotographic toner according to claim 1, wherein [dispersion particle size of] said resin negative charge control agent [is] has a dispersion particle size of between 0.05 and 1.50 μm length-wise, and between 0.02 and 1.00μm breadth-wise.

7. (Amended) The electrophotographic toner according to claim 1, wherein [temperature at which an apparent viscosity of] said resin negative charge control agent [becomes] has an apparent viscosity of 10^4 P (where 10^4 P = 10^4 g/cm·s) [is] between 85 and 110°C.

8. (Amended) The electrophotographic toner according to claim 1, wherein [volatile matter content in] said resin negative charge control agent [is] has a volatile matter content of 5% or less by weight based on the total weight of said resin negative charge control agent.

9. (Amended) The electrophotographic toner according to claim 1, wherein [volume resistivity of] said resin negative charge control agent [is] has a volume resistivity of between 9.5 and 11.5 log Ω·cm.

10. (Amended) The electrophotographic toner according to claim 1, wherein [weight average molecular weight of] said resin negative charge control agent [is] has a weight average molecular weight of between 5000 and 100000.

11. (Amended) The electrophotographic toner according to claim 1, wherein the weight % [ratio] of said resin negative charge control agent [to] based on the weight of the base toner particles is between 0.1 and 20 % by weight.

12. (Amended) The electrophotographic toner according to claim 1, wherein [acid value of] said binder resin [is] has an acid value of 20 mg KOH/g or less.

13. (Amended) A one-component developer which [contains] comprises an electrophotographic toner, said electrophotographic toner comprising at least a binder resin, a colorant, and a resin negative charge control agent,

wherein said binder resin is a polyester and/or a polyol, and

said negative charge control agent comprises [components which are] polymerized units of (1) sulfonic acid-containing monomers, (2) aromatic monomers having electron-withdrawing groups, and (3) acrylate monomer at least one non-fluorinated, [and/or] non-fluorinated methacrylate monomer or a mixture thereof .

14. (Amended) A two-component developer which [contains] comprises a carrier and an electrophotographic toner, said electrophotographic toner comprising at least a binder resin, a colorant, and a resin negative charge control agent,

wherein said binder resin is a polyester and/or a polyol, and

said negative charge control agent comprises [components which are] polymerized units of (1) sulfonic acid-containing monomers, (2) aromatic monomers having electron-withdrawing groups, and (3) at least one non-fluorinated acrylate monomer, [and/or] non-fluorinated methacrylate monomer or a mixture thereof.

16. (Amended) A container encasing a one-component developer, [which contains] said developer comprising an electrophotographic toner, said electrophotographic toner comprising at least a binder resin, a colorant, and a resin negative charge control agent,

wherein said binder resin is a polyester and/or a polyol, and

said negative charge control agent comprises [components which are] polymerized units of (1) sulfonic acid-containing monomers, (2) aromatic monomers having electron-withdrawing groups, and (3) at least one non-fluorinated acrylate monomer [and/or] non-fluorinated methacrylate monomer or a mixture thereof.

17. (Amended) A container encasing a two-component developer [which contains] , said developer comprising a carrier and an electrophotographic toner, said electrophotographic toner comprising at least a binder resin, a colorant, and a resin negative charge control agent,

wherein said binder resin is a polyester and/or a polyol, and

said negative charge control agent comprises [components which are] polymerized units of (1) sulfonic acid-containing monomers, (2) aromatic monomers having electron-withdrawing groups, and (3) acrylate monomer, at least one non-fluorinated [and/or] non-fluorinated methacrylate monomer or a mixture thereof.

18-19. (Canceled).

26-29. (New).--

COPY

#181 Attachment

LIST OF RELATED CASES

Docket Number	Serial or Patent No.	Filing or Issue Date	Status or Patentee
UNKNOWN	09/843,357	04/26/01	PENDING CIP
~~UNKNOWN~~	~~09/667,717~~	~~09/22/00~~	~~PENDING~~ No copy
UNKNOWN	09/643,910	08/23/00	PENDING CIP
UNKNOWN	09/712,927	11/16/00	PENDING CIP
0557-4896-0	6,303,258	10/16/01	GRANTED
0557-4832-0	6,103,441	08/15/00	GRANTED
0557-4820-0	6,183,926	02/06/01	GRANTED
0557-4419-0	6,074,794	06/13/00	GRANTED
0557-4090-0	5,851,716	12/22/98	GRANTED
UNKNOWN	5,882,832	03/16/99	GRANTED
0557-4127-2	5,879,849	03/09/99	GRANTED
0557-3877-0	6,004,715	12/21/99	GRANTED
UNKNOWN	5,225,303	07/06/93	GRANTED
UNKNOWN	5,168,028	12/01/92	GRANTED

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SHEET 1 OF 1

Form PTO 1449 (Modified)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. 214503US0	SERIAL NO. 09/964,622
LIST OF REFERENCES CITED BY APPLICANT		APPLICANT Toshiki NANYA, et al.	
		FILING DATE September 28, 2001	GROUP 1756

OIPE JC67 MAR 07 2003 PATENT & TRADEMARK OFFICE

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
	AA	6,269,228	07/31/01	KAYAHARA et al.			
	AB	6,212,351	04/03/01	KAWAGOE et al.			
	AC	6,445,900	09/03/02	FUKAO et al.			
	AD	6,405,002	06/11/02	OGIYAMA et al.			
	AE	6,505,024	01/07/03	KAYAHARA et al.			
	AF	6,449,453	09/10/02	MOTOHASHI			
	AG						
	AH						
	AI						
	AJ						
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	AL						
	AM						
	AN						

Duplicate of 1/28/03 IDS

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES	TRANSLATION NO
	AO					
	AP					
	AQ					
	AR					
	AS					
	AT					
	AU					
	AV					

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)

	AW	
	AX	
	AY	
	AZ	

☐ Additional References sheet(s) attached

Examiner	Date Considered

*Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Form PTO 1449 (Modified) — U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT

ATTY DOCKET NO.	SERIAL NO.
214503US0	09/964,622
APPLICANT	
Toshiki NANYA, et al.	
FILING DATE	**GROUP**
September 28, 2001	1752

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
	AA	4,908,290	03/13/90	Y. WATANABE, et al.			
	AB	4,956,258	09/11/90	Y. WATANABE, et al.			
	AC						
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FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES	TRANSLATION NO
	AO					
	AP					
	AQ					
	AR					
	AS					
	AT					
	AU					
	AV					

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)

	AW	
	AX	
	AY	
	AZ	

Examiner	Date Considered

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Form PTO 1449 (Modified)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. 214503US0	SERIAL NO. 09/964,622
LIST OF REFERENCES CITED BY APPLICANT		APPLICANT Toshiki NANYA, et al.	
		FILING DATE September 28, 2001	GROUP 1752

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
	AA						
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	AH						
	AI						
	AJ						
	AK						
	AL						
	AM						
	AN						

Supplemental IDS filed 11/6/02

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES	TRANSLATION NO
	AO	196 11 731	04/24/97	GERMANY		X
	AP	0 658 819	06/21/95	EUROPE		
	AQ	0 831 378	03/25/98	EUROPE		
	AR	59-129862	07/26/84	JAPAN (with English Abstract)		X
	AS					
	AT					
	AU					
	AV					

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)

	AW	
	AX	
	AY	
	AZ	

Examiner	Date Considered

*Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

WHAT IS CLAIMED IS:

1. An external additive for a toner, comprising:

a particulate inorganic material; and

a silicone oil,

wherein the silicone oil is present on the particulate inorganic material in an amount of Ws by weight and present as a free silicone oil in an amount of Wfs by weight, and wherein a free silicone degree defined as a ratio Wfs/Ws is from 10 to 70 %.

2. The external additive according to Claim 1, wherein the free silicone degree is from 30 to 50 %.

3. The external additive according to Claim 1, wherein the particulate inorganic material is selected from the group consisting of silica, titanium oxide and combinations thereof.

4. A method for preparing an external additive comprising:

coating a particulate inorganic material with a silicone oil; and

heating the inorganic material,

wherein after the heating the silicone oil is present on the particulate inorganic material in an amount of Ws by weight and present as a free silicone oil in an amount of Wfs by weight, and a free silicone degree defined as a ratio Wfs/Ws is from 10 to 70 %.

5. The method according to Claim 4, wherein the coating

is performed while the heating is performed.

6. The method according to Claim 4, wherein the heating is performed after the coating is performed.

7. A toner comprising:

a binder resin;

a colorant; and

an external additive,

wherein the external additive comprises:

a particulate inorganic material; and

a silicone oil,

wherein the silicone oil is present on the particulate inorganic material in an amount of Ws by weight and present as a free silicone oil in an amount of Wfs by weight, and wherein a free silicone degree defined as a ratio Wfs/Ws is from 10 to 70 %.

8. The toner according to Claim 7, wherein the free silicone degree is from 30 to 50 %.

9. The toner according to Claim 7, wherein the particulate inorganic material is selected from the group consisting of silica, titanium oxide and combinations thereof.

10. The toner according to Claim 7, wherein the toner has a weight average particle diameter not greater than 15 μm.

11. The toner according to Claim 7, further comprising another inorganic external additive having a number average particle diameter less than the number average particle diameter of the particulate inorganic material.

12. The toner according to Claim 7, further comprising a particulate resin serving as another external additive, wherein the particulate resin has a number average particle diameter greater than the number average particle diameter of the particulate inorganic material.

13. The toner according to Claim 7, wherein the toner has a spherical degree not less than 0.93.

14. The toner according to Claim 7, wherein the toner is used for an image forming method comprising a non-contact heat fixing method.

15. The toner according to Claim 7, wherein the toner is used for an image forming method comprising a paper-driven image transferring method.

16. The toner according to Claim 7, further comprises a magnetic material.

17. A toner combination for forming a full color image, consisting of a cyan toner, a magenta toner, a yellow toner and

a black toner, wherein at least one of the toners comprises:

a binder resin;

a colorant; and

an external additive,

wherein the external additive comprises:

a particulate inorganic material; and

a silicone oil,

wherein the silicone oil is present on the particulate inorganic material in an amount of Ws by weight and present as a free silicone oil in an amount of Wfs by weight, and wherein a free silicone degree defined as a ratio Wfs/Ws is from 10 to 70 %.

18. The toner combination according to Claim 17, wherein the free silicone degree is from 30 to 50 %.

19. The toner combination according to Claim 17, wherein the particulate inorganic material is selected from the group consisting of silica, titanium oxide and combinations thereof.

20. The toner combination according to Claim 17, wherein the toner combination is used for an image forming method comprising a non-contact heat fixing method.

21. The toner combination according to Claim 17, wherein the toner combination is used for an image forming method comprising a paper-drive image transferring method.

22. A two component developer comprising:

a magnetic carrier; and

the toner according to Claim 7.

23. A toner container containing the toner according to Claim 7.

24. A toner container containing the two component developer according to Claim 22.

25. An image forming method comprising:

developing an electrostatic latent image on an image bearing member with a developer comprising a toner to form a toner image thereon; and

transferring the toner image onto a receiving material, wherein the toner is the toner according to Claim 7.

26. The image forming method according to Claim 25, wherein the developer is the two component developer according to Claim 22.

27. The image forming method according to Claim 25, wherein the transferring is performed upon application of pressure to the receiving material.

28. The image forming method according to Claim 25, further comprising fixing the toner image on the receiving material by

a non-contact heating method.

29. The image forming method according to Claim 25, wherein the transferring is performed while the image bearing member is driven by a paper-drive method.

30. The image forming method according to Claim 25, further comprising:

repeating the developing and transferring using plural color developers each including a different color toner to form a full color image on the receiving material, wherein each of the plural color toners is a toner according to Claim 7.

31. An image forming method comprising:

developing an electrostatic latent image formed on an image bearing member with a color developer comprising a color toner to form a color toner image on the image bearing member;

transferring the color toner image on the image bearing member onto a receiving material upon application of pressure to the receiving material; and

repeating the electrostatic latent image developing step and the color toner transferring step plural times using plural different color developers each including a different color toner to form a full color toner image on the receiving material, wherein each of the different color toners is a toner according to Claim 7.

32. The image forming method according to Claim 31, wherein the developing is performed by a developing device having plural color developing sections, wherein each of the plural color developing sections comprises one of the plural color developers, a developing roller and a regulating blade, wherein the developing further comprises:

forming a layer of each of the respective plural color developers on the respective developing roller using the respective regulating blade; and

contacting the layer with the electrostatic latent image to form the color toner image on the image bearing member.

33. The image forming method according to Claim 31, further comprising:

fixing the full color image on the receiving material by a non-contact heat fixing method.

34. The image forming method according to Claim 31, wherein the transferring is performed while the image bearing member is driven by a paper-drive method.

35. An image forming method comprising:

developing an electrostatic latent image formed on an image bearing member with a color developer comprising a color toner to form a color toner image on the image bearing member;

first transferring the color toner image on the image bearing member onto an intermediate transfer medium upon

application of pressure thereto;

repeating the electrostatic latent image developing step and the first color toner transferring step plural times using plural different color developers each including a different color toner to form a full color toner image on the intermediate transfer medium; and

second transferring the full color image onto a receiving material,

wherein each of the different color toners is a toner according to Claim 7.

36. The image forming method according to Claim 35, wherein the developing is performed by a developing device having plural color developing sections, wherein each of the plural color developing sections comprises one of the plural color developers, a developing roller and a regulating blade, wherein the developing further comprises:

forming a layer of each of the respective plural color developers on the respective developing roller using the respective regulating blade; and

contacting the layer with the electrostatic latent image to form the color toner image on the image bearing member.

37. The image forming method according to Claim 35, further comprising:

fixing the full color image on the receiving material by a non-contact heat fixing method.

38. The image forming method according to Claim 35, wherein the transferring is performed while the image bearing member is driven by a paper-drive method.

39. An image forming method comprising:

developing electrostatic latent images formed on plural image bearing members with plural color developers each comprising a different color toner to form a different color toner image on each of the image bearing members, respectively; and

transferring the color toner images onto a receiving material one by one upon application of pressure to form a full color image thereon,

wherein each of the different color toners is a toner according to Claim 7.

40. The image forming method according to Claim 39, wherein the transferring further comprises:

first transferring the color toner images on the image bearing members one by one onto an intermediate transfer medium upon application of pressure to form the full color image on the intermediate transfer medium; and

second transferring the full color image onto the receiving material.

41. The image forming method according to Claim 39, wherein

the developing is performed by a developing device having plural color developing sections, wherein each of the plural color developing sections comprises one of the plural color developers, a developing roller and a regulating blade, wherein the developing further comprises:

forming a layer of each of the respective plural color developers on the respective developing roller using the respective regulating blade; and

contacting the respective layer with the respective electrostatic latent image to form the different color toner image on each of the image bearing members.

42. The image forming method according to Claim 39, further comprising:

fixing the full color image on the receiving material by a non-contact heat fixing method.

43. The image forming method according to Claim 39, wherein the transferring is performed while the image bearing member is driven by a paper-drive method.

44. An electrophotographic image forming apparatus comprising:

an image bearing member which bears an electrostatic latent image;

a developing device which develops the latent image with a developer comprising a toner to form a toner image on the image

bearing member; and

a toner container containing the developer therein; wherein the toner is the toner according to Claim 7.

ABSTRACT OF THE DISCLOSURE

A toner including a binder resin; a colorant; and an external additive, wherein the external additive includes a particulate inorganic material, and a silicone oil, wherein the silicone oil is present on the particulate inorganic material in an amount of Ws by weight and present as a free silicone oil in an amount of Wfs by weight, and a free silicone degree defined as a ratio Wfs/Ws is from 10 to 70 %.

FIG. 1

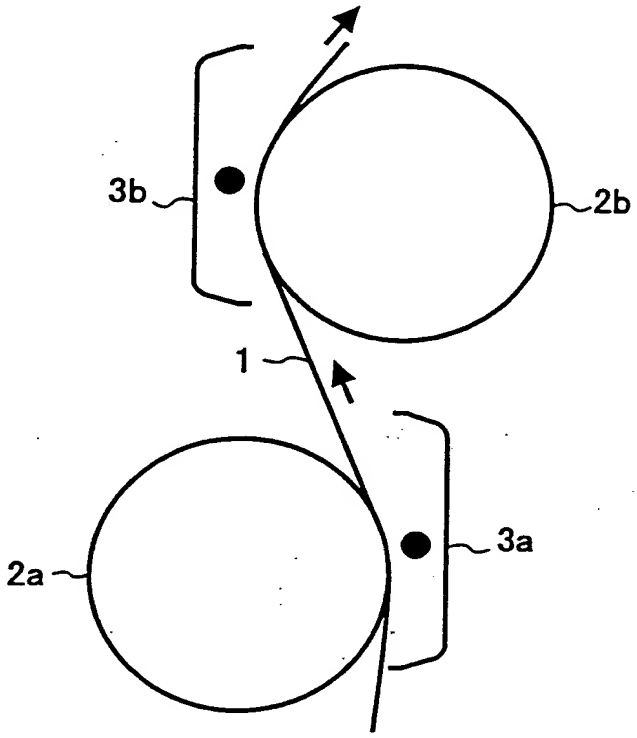


FIG. 2

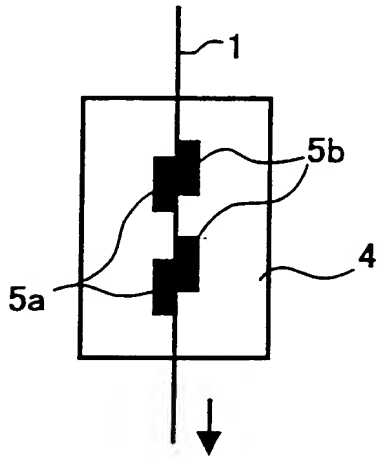
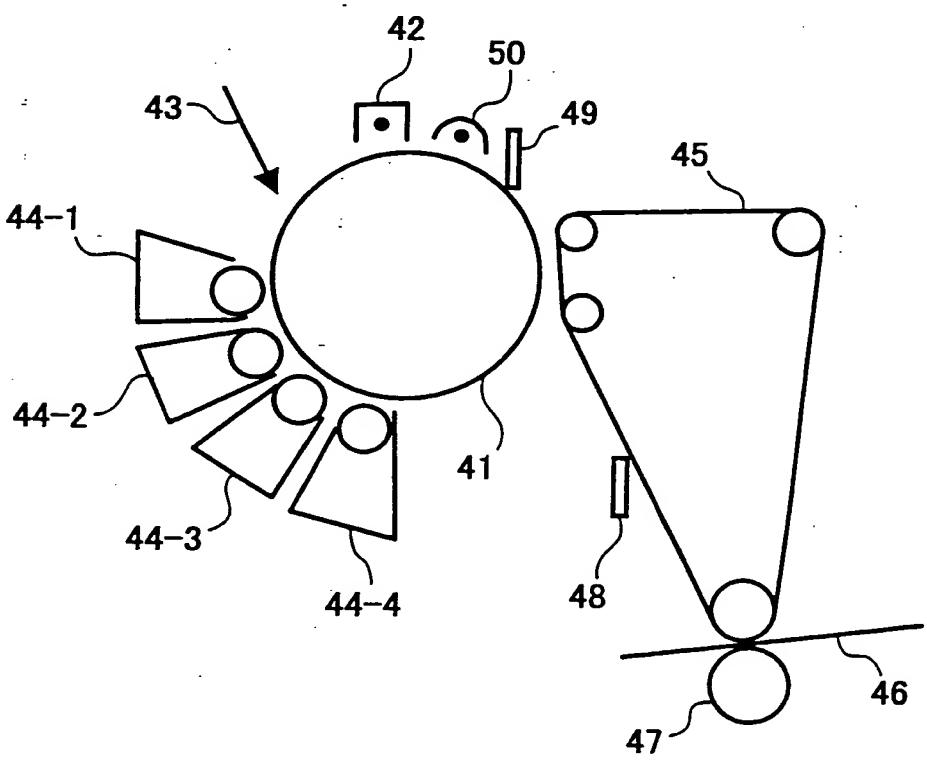


FIG. 3



CLAIMS

1. An image formation process, wherein, in forming an electrostatic latent image according to an electrophotographic method and in forming a toner image by visualizing the electrostatic latent image with a developing agent, an electrically conducting brush is used as electric charging means, the brush, which is impressed with a voltage, is brought into contact with an image carrier to execute uniform electric charging, the electrostatic latent image is formed on the surface of the image carrier by the exposure to the image-bearing light, and the toner image is formed by a nonmagnetic one-component developing system using a developing agent of a toner having a circularity within a range of from 0.92 to 0.98.

2. An image formation process according to claim 1, wherein said image carrier is a photosensitive material, and the length of the short axis of an exposure spot on the photosensitive material is from 10 to 60 μm.

3. An image formation process according to claim 1, wherein said nonmagnetic one-component developing system is executed by using a developing device equipped with a developing roller and a developing blade which uniformly limits the thickness of the toner layer fed onto said developing roller.

4. An image formation process according to claim 1, wherein said electrically conducting brush is the one in which carbon black is dispersed in a fiber, the fiber having a diameter of from 400 to 800 deniers/100 F and having a density of from 50,000 to 150,000 F/in^2.

5. An image formation process according to claim 3, wherein the amount of electric charge of the toner on the developing roller is from 15 to 40 μC/g in terms of an absolute value.

6. An image formation process according to claim 1, wherein said toner has a volume average particle

diameter of from 6 to 10 μm, and has such a particle diameter distribution that the particles of not smaller than 12.7 μm are contained in an amount of not larger than 1.0% by weight.

7. An image formation process according to claim 1, wherein said toner has a volume average particle diameter of from 6 to 10 μm, and has such a particle diameter distribution that the particles of not larger than 5 μm are contained in an amount of not larger than 15 particle number %.

8. An image formation process according to claim 1, wherein said toner is a color toner, and is used for the formation of a full-color image.

9. A developing agent for electrophotography comprising a toner having a circularity over a range of from 0.92 to 0.98, the developing agent for electrophotography being used in an image formation process which forms the toner image by the nonmagnetic one-component developing system by bringing an electrically conducting brush impressed with a voltage into contact with a photosensitive material, and forming an electrostatic latent image on the photosensitive material by the exposure to the image-bearing light.

10. A developing agent for electrophotography according to claim 9, wherein the amount of electric charge of the toner on the developing roller is from 15 to 40 μC/g in terms of an absolute value.

11. A developing agent for electrophotography according to claim 9, wherein said toner has a volume average particle diameter of from 6 to 10 μm, and has such a particle diameter distribution that the particles of not smaller than 12.7 μm are contained in an amount of not larger than 1.0% by weight.

12. A developing agent for electrophotography according to claim 9, wherein said toner has a volume

average particle diameter of from 6 to 10 μm, and has such a particle diameter distribution that the particles of not larger than 5 μm are contained in an amount of not larger than 15 particle number %.

13. A developing agent for electrophotography according to claim 9, wherein said toner is a color toner.

14. An image formation process, wherein, in forming an electrostatic latent image according to an electrophotographic method and in forming a toner image by visualizing the electrostatic latent image with a developing agent, an electrically conducting brush is used as electric charging means, the brush which is impressed with a voltage is brought into contact with an image carrier to execute uniform electric charging, the electrostatic latent image is formed on the surface of the image carrier by the exposure to the image-bearing light, and the toner image is formed by using a developing agent of a toner containing at least an externally added agent having an average particle diameter over a range of from 0.1 to 2.0 μm and a freeing ratio of not larger than 20%.

15. An image formation process according to claim 14, wherein said image carrier is a photosensitive material.

16. An image formation process according to claim 14, wherein the freeing ratio of said externally added agent is not larger than 40% as measured after the developing unit for forming the toner image by using the developing agent is operated with no load for 20 hours.

17. An image formation process according to claim 14, wherein the polarity of said externally added agent is different from the polarity of the mother toner particles constituting the developing agent.

18. An image formation process according to claim 14, wherein at least one kind of the externally added

agents among the externally added agents included in the developing agent has an average particle diameter which is not smaller than 1/40 times of the average particle diameter of the toner constituting the developing agent.

19. An image formation process according to claim 14, wherein said electrically conducting brush has an electric resistance of from 1×10^3 to 1×10^7 Ω.

20. An image formation process according to claim 14, wherein said toner is a color toner and is used for forming a full-color image.

21. A developing agent for electrophotography comprising a toner and containing at least an externally added agent having an average particle diameter over a range of from 0.1 to 2.0 μm and a freeing ratio of not larger than 20%, the developing agent for electrophotography being used in an image formation process which forms the toner image by the nonmagnetic one-component developing system by bringing an electrically conducting brush impressed with a voltage into contact with a photosensitive material, and forming an electrostatic latent image on the photosensitive material by exposure to the image-bearing light.

22. A developing agent for electrophotography according to claim 21, wherein the freeing ratio of said externally added agent is not larger than 40% as measured after the developing unit for forming the toner image by using the developing agent is operated with no load for 20 hours.

23. A developing agent for electrophotography according to claim 21, wherein the polarity of said externally added agent is different from the polarity of the mother toner particles constituting the developing agent.

24. A developing agent for electrophotography according to claim 21, wherein at least one kind of the externally added agents among the externally added agents

included in the developing agent has an average particle diameter which is not smaller than 1/40 times of the average particle diameter of the toner constituting the developing agent.

25. A developing agent for electrophotography according to claim 21, wherein said toner is a color toner.

IMAGE FORMATION PROCESS AND DEVELOPER USED THEREIN

ABSTRACT OF THE DISCLOSURE

An image formation process which forms a toner image by the nonmagnetic one-component developing system by bringing an electrically conducting brush impressed with a voltage into contact with a photosensitive material to effect the uniform charging, and forming an electrostatic latent image on the photosensitive material by the exposure to the image-bearing light, wherein the toner that is used as a circularity of from 0.92 to 0.98. The nonmagnetic one-component developing system minimizes irregular electric charging that stems from the use of the electrically conducting brush. This action is obtained even in full-color developing system which effects development many times.

Fig.1

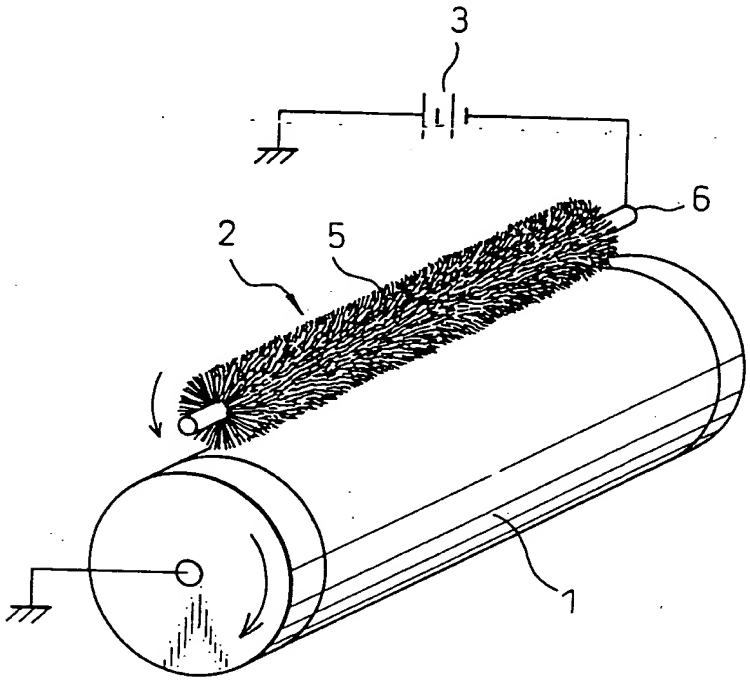


Fig. 2

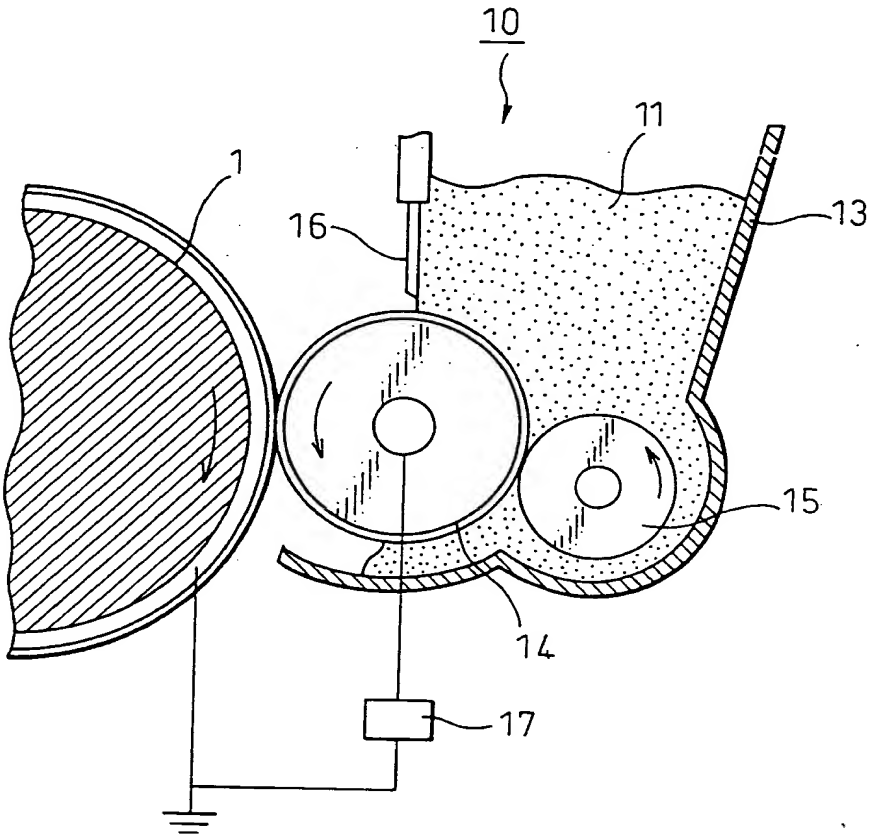


Fig.3

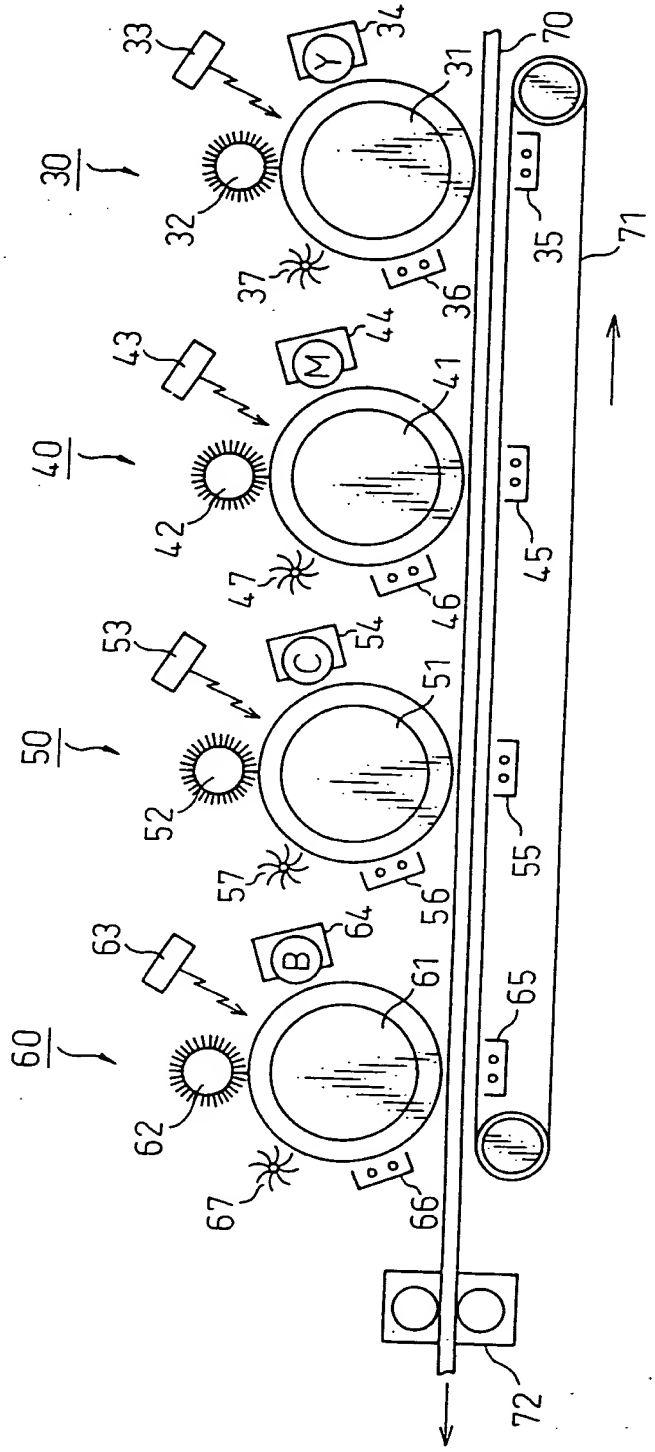
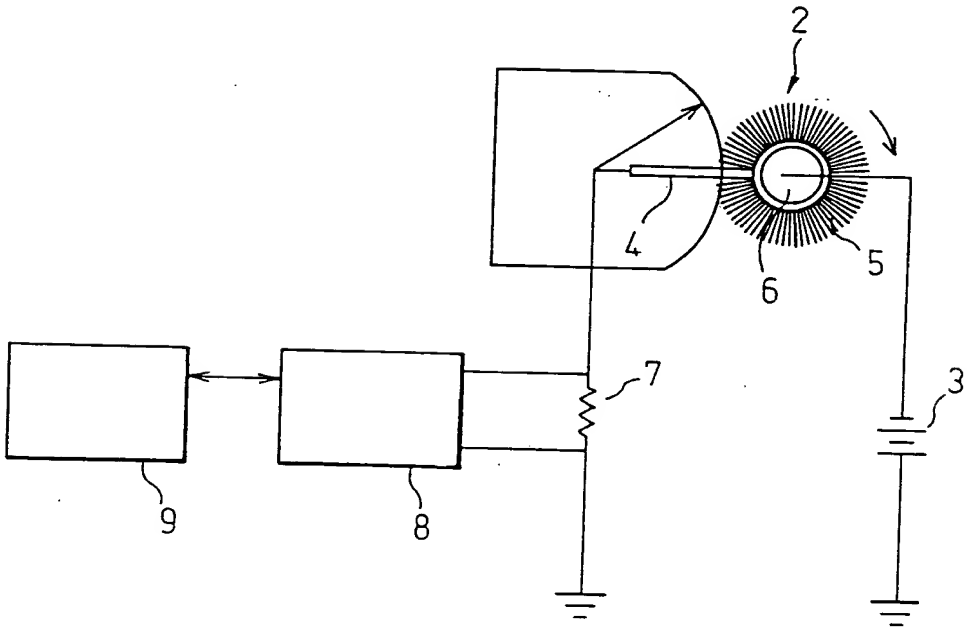


Fig. 4



CLAIMS

1. A method for the formation of a color image which comprises the steps of forming an electrostatic latent image in accordance with an electrophotographic process, visualizing said electrostatic latent image by a developer to form a multicolored toner image whereby each monochromatic color toner image is formed by a mutually independent developing step, and superposing then the resulting monochromatic toner images with one another to form a multicolored toner image, and in which method a toner used in each developing step contains an external additive, the addition amount of the external additive to a non-added toner containing no external additive is within the range of 1.5 to 10.0 parts by weight on the basis of 100 parts by weight of said non-added toner, and the aggregation degree of said toner is within the range of 30 to 80%, and the change ratio of the aggregation degree satisfies the following formula:

$0.8 \leq$ (initial aggregation degree)/(aggregation degree after 20 hours of no-load revolution of developing portion) ≤ 1.2.

2. A color image formation method according to claim 1 wherein a mixture of particles having a mean particle diameter of 30 to 100 nm and particles having a mean particle diameter smaller than the former is used as said external additive.

3. A color image formation method according to claim 1, wherein said external additive is inorganic fine particles, polymeric fine particles or a mixture thereof.

4. A color image formation method according to claim 3, wherein said inorganic fine particles are fine particles selected from the group consisting of silica, alumina, titanium oxide, barium titanate, magnesium titanate, calcium titanate, strontium titanate, zinc oxide, tin oxide, silica sand, clay, mica, diatomaceous earth, chromium oxide, cerium oxide, iron oxide red,

9. A method for the formation of a color image which comprises the steps of forming an electrostatic latent image in accordance with an electrophotographic process, visualizing said electrostatic latent image by a developer to form a multicolored toner image whereby each monochromatic color toner image is formed by a mutually independent developing step, and then superposing the resulting monochromatic toner images with one another to form a multicolored toner image, and in which method a toner used in each developing step contains an external additive, the addition amount of the external additive to a non-added toner containing no external additive is within the range of 1.5 to 10.0 parts by weight on the basis of 100 parts by weight of said non-added toner, and the change ratio of the electrostatic charge amount of said toner on an image support for forming and visualizing said electrostatic latent image satisfies the following formula:

$$1.0 \leqq \frac{\text{(initial charge amount)}}{\text{(charge amount after 20 hours of no-load revolution of developing portion)}} \leqq 1.5.$$

10. A color image formation method according to claim 9, wherein a mixture of particles having a mean particle diameter of 30 to 100 nm and particles having a mean particle diameter smaller than the former is used as said external additive.

11. A color image formation method according to claim 9, wherein said external additive is inorganic fine particles, polymeric fine particles or a mixture thereof.

12. A color image formation method according to claim 11, wherein said inorganic fine particles are fine particles selected from the group consisting of silica, alumina, titanium oxide, barium titanate, magnesium titanate, calcium titanate, strontium titanate, zinc oxide, tin oxide, silica sand, clay, mica, diatomaceous earth, chromium oxide, cerium oxide, iron oxide red,

antimony trioxide, magnesium oxide, zirconium oxide, barium sulfate, barium carbonate, calcium carbonate, silica carbide and silicon nitride.

13. A color image formation method according to claim 12, wherein said inorganic fine particle have a primary particle diameter of 0.005 to 2 μm and the specific surface area, measured by the BET method, of 20 to 500 m^2/g.

14. A color image formation method according to claim 11, wherein said polymeric fine particles are fine particles selected from the group consisting of polystyrene, copolymers of methacrylic acid ester and acrylic acid ester, polycondensates of silicone and benzoguanamine, nylon and thermosetting resins.

15. A color image formation method according to claim 9, wherein said developer is a nonmagnetic one-component developer.

16. A color image formation method according to claim 9, in which monochromatic toner image of yellow, magenta, cyan and black each is formed by the following steps:

(1) charging step for imparting photosensitivity to an image support as an electrostatic recording medium;

(2) exposing step of applying image formation exposure to the image support, and forming and recording an electrostatic latent image;

(3) developing step of causing the electrostatic latent image recorded on the image support to electrically attract a developer, and physically visualizing the electrostatic latent image;

(4) transferring step of serially transferring the visualized toner image on the image support to the recording medium, and superposing the visualized toner images with one another; and

(5) image fixing step of heating and fixing the transferred image on the recording medium.

COLOR IMAGE FORMATION METHOD

ABSTRACT OF THE DISCLOSURE

In a method for forming a multicolored toner image in accordance with an electrophotographic process, the addition amount of external additives to a non-added toner is 1.5 to 10.0 parts by weight per 100 parts by weight of the non-added toner in each developing step, the aggregation degree of the toner is within the range of 30 to 80%, and the change ratio of the aggregation degree satisfies the relation:

$0.8 \leqq$ (initial aggregation degree/aggregation degree after no-load revolution of developing portion for 20 hours) $\leqq 1.2$.

According to this method, it becomes possible to form a high-quality color image while a toner always keeps a stable degree of aggregation and a charge amount.

Fig.1

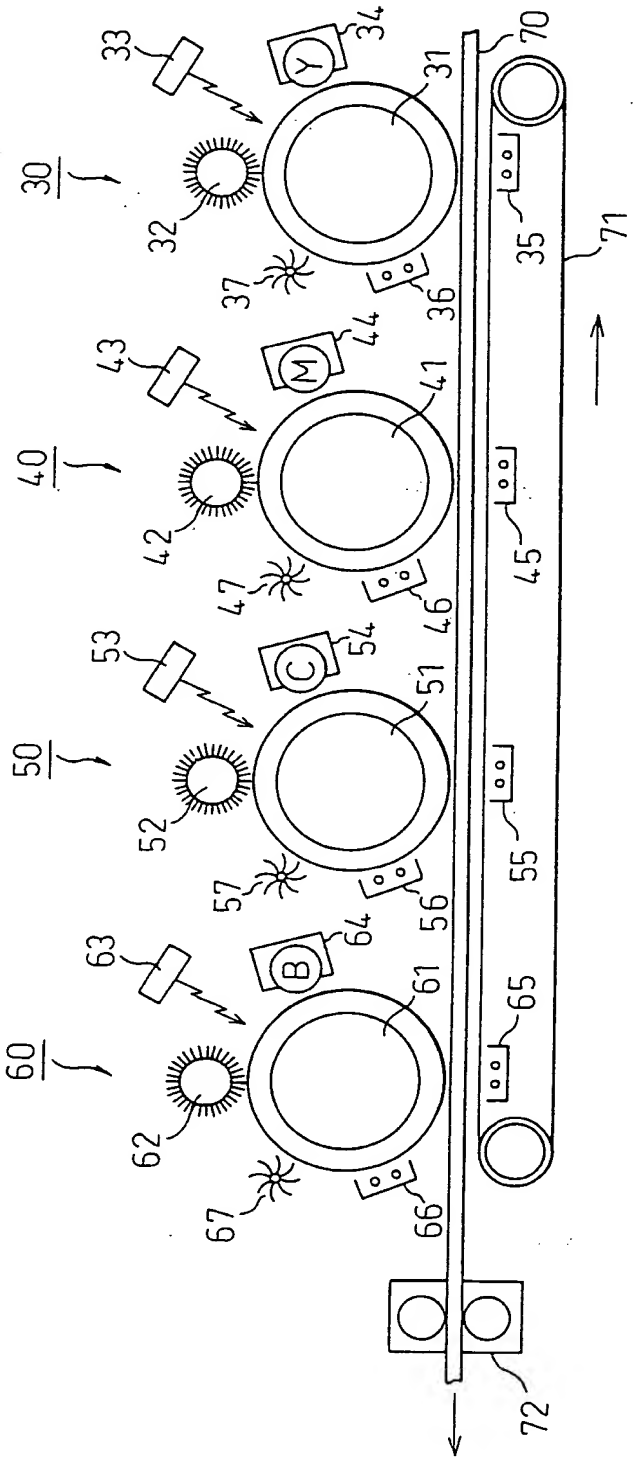


Fig.2